

## SEQUENCE LISTING

<110> ISHIKAWA, Yukiko  
 IMAIZUMI, Akira  
 MATSUI, Kazuhiko  
 KOJIMA, Hiroyuki

<120> Method for Producing Target Substance by Fermentation

<130> OP1582

<150> JP 2002-203764

<151> 2002-07-12

<160> 32

<170> PatentIn Ver. 2.0

<210> 1

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
 amplifying Escherichia coli arcA gene

<400> 1

cccaagctta aagcccttta cttagctta

29

<210> 2

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
 amplifying Escherichia coli arcA gene

<400> 2

tccgcgcat ctgtcgcttc

20

<210> 3

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
sequencing of Escherichia coli arcA gene

<400> 3

gaagcgacag atggcgcgga aaagctacaa gttcaatggt

40

<210> 4

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
sequencing of Escherichia coli arcA gene

<400> 4

gggtctagag gttgaaaaat aaaaacggc

29

<210> 5

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli dam gene

<400> 5

cccaagcttc cgtggatgt cctggtttc

29

<210> 6

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli dam gene

<400> 6

agactgalca ggtcgctatt

20

<210> 7

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
sequencing of Escherichia coli dam gene

<400> 7

aalagcgacc tgalcagctt gccttatgca ccgctgtctg

40

<210> 8

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli dam gene

<400> 8

gggtctagac gtcagattgg gaacatagt

29

<210> 9

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli fnr gene

<400> 9

cccaagcttg caattgggcc gtcctggcg 29

<210> 10

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli fnr gene

<400> 10

tcaagctgat caagctcatg 20

<210> 11

<211> 39

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli fnr gene

<400> 11

caggagttga tcagcttgag aaaaatgccg aggaacgic 39

<210> 12

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
sequencing of Escherichia coli fnr gene

<400> 12

gggtctagat tggctgtcct ggtaggat 29

<210> 13

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
sequencing of Escherichia coli sucA gene

<400> 13

cccaagcttc tgcccctgac actaagaca

29

<210> 14

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli sucA gene

<400> 14

cgaggtaacg ttcaagacct

20

<210> 15

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Escherichia coli sucA gene

<400> 15

aggtcttgaa cgttacctcg atccataacg ggcagggcgc

40

<210> 16

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for

amplifying *Escherichia coli* *sucA* gene

&lt;400&gt; 16

gggtctagac cactttgtca gtttcgatt

29

&lt;210&gt; 17

&lt;211&gt; 29

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence: primer for  
amplifying *Pantoea ananatis* *arcA* gene

&lt;400&gt; 17

cccgaattcc ctgtttcgat ttagttggc

29

&lt;210&gt; 18

&lt;211&gt; 29

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

&lt;220&gt;

<223> Description of Artificial Sequence: primer for  
amplifying *Pantoea ananatis* *arcA* gene

&lt;400&gt; 18

cccgcattgcg attaatcttc cagatcacc

29

&lt;210&gt; 19

&lt;211&gt; 759

&lt;212&gt; DNA

<213> *Pantoea ananatis*

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (41).. (757)

&lt;400&gt; 19

ccctgttttc aatttagttg gcaaaattag gtagctaaac atg cag acc ccg cac 55  
Met Gln Thr Pro His

	<b>1</b>									<b>5</b>													
att ctc atc gtt gaa gac gaa ctg gtc acg cgc aat acc ctc aaa agc	<b>103</b>																						
Ile Leu Ile Val Glu Asp Glu Leu Val Thr Arg Asn Thr Leu Lys Ser																							
<b>10</b>						<b>15</b>						<b>20</b>											
att ttt gag gcg gaa ggt tat gtc glg tac gaa gcg acc gat ggt gca	<b>151</b>																						
Ile Phe Glu Ala Glu Gly Tyr Val Val Tyr Glu Ala Thr Asp Gly Ala																							
<b>25</b>						<b>30</b>						<b>35</b>											
gag atg cac cag gtg ttg acc gac aat gal gtc aat ctg gtt att atg	<b>199</b>																						
Glu Met His Gln Val Leu Thr Asp Asn Asp Val Asn Leu Val Ile Met																							
<b>40</b>						<b>45</b>						<b>50</b>											
gac atc aat ctg ccg ggt aaa aac gcc ctg tta ctg gca cgt gaa ctg	<b>247</b>																						
Asp Ile Asn Leu Pro Gly Lys Asn Gly Leu Leu Leu Ala Arg Glu Leu																							
<b>55</b>						<b>60</b>						<b>65</b>											
cgt gag caa gcc aat gtc gca ttg atg ttc ctg acc gga cgc gat aac	<b>295</b>																						
Arg Glu Gln Ala Asn Val Ala Leu Met Phe Leu Thr Gly Arg Asp Asn																							
<b>70</b>						<b>75</b>						<b>80</b>						<b>85</b>					
gaa gtc gat aaa att ctt ggg ctg gaa att ggt gca gac gac tac att	<b>343</b>																						
Glu Val Asp Lys Ile Leu Gly Leu Glu Ile Gly Ala Asp Asp Tyr Ile																							
<b>90</b>						<b>95</b>						<b>100</b>											
act aag ccg ttt aac cca cgc gaa tta act att cgt gca cgt aac ctg	<b>391</b>																						
Thr Lys Pro Phe Asn Pro Arg Glu Leu Thr Ile Arg Ala Arg Asn Leu																							
<b>105</b>						<b>110</b>						<b>115</b>											
ctg ttg cgc acc atg aat ttg cct tta ccc aat gaa gag cgt cgc cag	<b>439</b>																						
Leu Leu Arg Thr Met Asn Leu Pro Leu Pro Asn Glu Glu Arg Arg Gln																							
<b>120</b>						<b>125</b>						<b>130</b>											
gtt gaa agc tat aag ttc aac gcc tgg gag ctg gac atc aac agc cgc	<b>487</b>																						
Val Glu Ser Tyr Lys Phe Asn Gly Trp Glu Leu Asp Ile Asn Ser Arg																							
<b>135</b>						<b>140</b>						<b>145</b>											
tca ctc atc aat ccc aac ggt gag cag tac aaa ctg ccg cgc agt gag	<b>535</b>																						
Ser Leu Ile Asn Pro Asn Gly Glu Gln Tyr Lys Leu Pro Arg Ser Glu																							
<b>150</b>						<b>155</b>						<b>160</b>						<b>165</b>					
ttc cgt gcc atg ctg cac ttc tgc gaa aat ccc gcc aag att cag acg	<b>583</b>																						
Phe Arg Ala Met Leu His Phe Cys Glu Asn Pro Gly Lys Ile Gln Thr																							
<b>170</b>						<b>175</b>						<b>180</b>											
cgt gct gat ttg ctg aag aaa atg acc gga cgc gat ctc aag cca cac	<b>631</b>																						
Arg Ala Asp Leu Leu Lys Lys Met Thr Gly Arg Asp Leu Lys Pro His																							
<b>185</b>						<b>190</b>						<b>195</b>											
gac cgt act gtt gac gtg aca atc cgt cgt atc cgt aaa cat ttt gaa	<b>679</b>																						
Asp Arg Thr Val Asp Val Thr Ile Arg Arg Ile Arg Lys His Phe Glu																							
<b>200</b>						<b>205</b>						<b>210</b>											
tcc acg cca gat acc cct gaa atc atc gcc acc att cac gcc gaa ggt	<b>727</b>																						

Ser Thr Pro Asp Thr Pro Glu Ile Ile Ala Thr Ile His Gly Glu Gly  
 215 220 225  
 tat cgt ttc tgt ggt gac ctg cag gat taa gc 759  
 Tyr Arg Phe Cys Gly Asp Leu Gln Asp Stop

<210> 20

<211> 238

<212> PRT

<213> *Pantoea ananatis*

<400> 20

Met Gln Thr Pro His Ile Leu Ile Val Glu Asp Glu Leu Val Thr Arg  
 1 5 10 15  
 Asn Thr Leu Lys Ser Ile Phe Glu Ala Glu Gly Tyr Val Val Tyr Glu  
 20 25 30  
 Ala Thr Asp Gly Ala Glu Met His Gln Val Leu Thr Asp Asn Asp Val  
 35 40 45  
 Asn Leu Val Ile Met Asp Ile Asn Leu Pro Gly Lys Asn Gly Leu Leu  
 50 55 60  
 Leu Ala Arg Glu Leu Arg Glu Gln Ala Asn Val Ala Leu Met Phe Leu  
 65 70 75 80  
 Thr Gly Arg Asp Asn Glu Val Asp Lys Ile Leu Gly Leu Glu Ile Gly  
 85 90 95  
 Ala Asp Asp Tyr Ile Thr Lys Pro Phe Asn Pro Arg Glu Leu Thr Ile  
 100 105 110  
 Arg Ala Arg Asn Leu Leu Leu Arg Thr Met Asn Leu Pro Leu Pro Asn  
 115 120 125  
 Glu Glu Arg Arg Gln Val Glu Ser Tyr Lys Phe Asn Gly Trp Glu Leu  
 130 135 140  
 Asp Ile Asn Ser Arg Ser Leu Ile Asn Pro Asn Gly Glu Gln Tyr Lys  
 145 150 155 160  
 Leu Pro Arg Ser Glu Phe Arg Ala Met Leu His Phe Cys Glu Asn Pro  
 165 170 175  
 Gly Lys Ile Gln Thr Arg Ala Asp Leu Leu Lys Lys Met Thr Gly Arg  
 180 185 190  
 Asp Leu Lys Pro His Asp Arg Thr Val Asp Val Thr Ile Arg Arg Ile  
 195 200 205  
 Arg Lys His Phe Glu Ser Thr Pro Asp Thr Pro Glu Ile Ile Ala Thr  
 210 215 220  
 Ile His Gly Glu Gly Tyr Arg Phe Cys Gly Asp Leu Gln Asp  
 225 230 235



<210> 21  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
 amplifying ori6K and mobRP4 gene

<400> 21  
 tcatagatct tttagattga tttatggtgc 30

<210> 22  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
 amplifying ori6K and mobRP4 gene

<400> 22  
 ccacagatct aattcccatg tcagccgta 30

<210> 23  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
 amplifying Chloramphenicol resistant gene

<400> 23  
 ataaagatct ggtgccctgt tgalaccggg 30

<210> 24  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Chloramphenicol resistant gene

<400> 24

ggggagatct tgcaaggcga ttaagttagg

30

<210> 25

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying kanamycin resistant gene

<400> 25

cccagatcta gttttcgccc cgaagaacg

29

<210> 26

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying kanamycin resistant gene

<400> 26

cccagatctc cagagtcgag ctcagaaga

29

<210> 27

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer for  
amplifying Pantoea ananatis arcA gene

<400> 27	
cccgaattcg cgaccgatgg tgcagagat	29
<210> 28	
<211> 20	
<212> DNA	
<213> Artificial Sequence	
<220>	
<223> Description of Artificial Sequence: primer for amplifying Pantoea ananatis arcA gene	
<400> 28	
aaggcaaatt catggcgcg	20
<210> 29	
<211> 29	
<212> DNA	
<213> Artificial Sequence	
<220>	
<223> Description of Artificial Sequence: primer for amplifying Pantoea ananatis arcA gene	
<400> 29	
gcgcaccatg aatttgcctt acccaatgaa gagcgctgcc	40
<210> 30	
<211> 29	
<212> DNA	
<213> Artificial Sequence	
<220>	
<223> Description of Artificial Sequence: primer for amplifying Pantoea ananatis arcA gene	
<400> 30	
cccgatgca ccttcgccgt gaatggtgg	29
<210> 31	
<211> 927	

&lt;212&gt; DNA

&lt;213&gt; Escherichia coli

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (101).. (817)

&lt;400&gt; 31

```

gtcatgttac gccgatcatg ttaatttgca gcatgcatca ggcaggatcag ggacttttgt 60
acttccgtgt tcatgttagt tggcaattta ggtagcaaac atg cag acc ccg cac 115
                                         Met Gln Thr Pro His
                                         1           5

att ctt atc gtt gaa gac gag ttg gla aca cgc aac acg ttg aaa agt 163
Ile Leu Ile Val Glu Asp Glu Leu Val Thr Arg Asn Thr Leu Lys Ser
          10           15           20

att ttc gaa gcg gaa ggc tat gat gtt ttc gaa gcg aca gat ggc gcg 211
Ile Phe Glu Ala Glu Gly Tyr Asp Val Phe Glu Ala Thr Asp Gly Ala
          25           30           35

gaa atg cat cag atc ctc tct gaa tat gac atc aac ctg gtg atc atg 259
Glu Met His Gln Ile Leu Ser Glu Tyr Asp Ile Asn Leu Val Ile Met
          40           45           50

gat atc aat ctg ccg ggt aag aac ggt ctt ctg tta gcg cgt gaa ctg 307
Asp Ile Asn Leu Pro Gly Lys Asn Gly Leu Leu Leu Ala Arg Glu Leu
          55           60           65

cgc gag cag gcg aat gtt gcg ttg atg ttc ctg act ggc cgt gac aac 355
Arg Glu Gln Ala Asn Val Ala Leu Met Phe Leu Thr Gly Arg Asp Asn
          70           75           80           85

gaa gtc gat aaa att ctc ggc ctc gaa atc ggt gca gat gac tac atc 403
Glu Val Asp Lys Ile Leu Gly Leu Glu Ile Gly Ala Asp Asp Tyr Ile
          90           95           100

acc aaa ccg ttc aac ccg cgt gaa ctg acg att cgt gca cgc aac cta 451
Thr Lys Pro Phe Asn Pro Arg Glu Leu Thr Ile Arg Ala Arg Asn Leu
          105           110           115

ctg tcc cgt acc atg aat ctg ggt act gtc agc gaa gaa cgt cgt agc 499
Leu Ser Arg Thr Met Asn Leu Gly Thr Val Ser Glu Glu Arg Arg Ser
          120           125           130

gtt gaa agc tac aag ttc aat ggt tgg gaa ctg gac atc aac agc cgt 547
Val Glu Ser Tyr Lys Phe Asn Gly Trp Glu Leu Asp Ile Asn Ser Arg
          135           140           145

tcg ttg atc ggc cct gat ggc gag cag tac aag ctg ccg cgc agc gag 595
Ser Leu Ile Gly Pro Asp Gly Glu Gln Tyr Lys Leu Pro Arg Ser Glu

```

150	155	160	165	
ttc cgc gcc atg ctt cac ttc tgt gaa aac cca ggc aaa att cag tcc				643
Phe Arg Ala Met Leu His Phe Cys Glu Asn Pro Gly Lys Ile Gln Ser				
	170	175	180	
cgt gct gaa ctg ctg aag aaa atg acc ggc cgt gag ctg aaa ccg cac				691
Arg Ala Glu Leu Leu Lys Lys Met Thr Gly Arg Glu Leu Lys Pro His				
	185	190	195	
gac cgt act gta gac gtg acg atc cgc cgt att cgt aaa cat ttc gaa				739
Asp Arg Thr Val Asp Val Thr Ile Arg Arg Ile Arg Lys His Phe Glu				
	200	205	210	
tct acg ccg gat acg ccg gaa atc atc gcc acc att cac ggt gaa ggt				787
Ser Thr Pro Asp Thr Pro Glu Ile Ile Ala Thr Ile His Gly Glu Gly				
	215	220	225	
tat cgc ttc tgc ggt gat ctg gaa gat taa tcggctttac caccgtcaaa				837
Tyr Arg Phe Cys Gly Asp Leu Glu Asp				
230	235			
aaaaacggcg ctttttagcg ccgtttttat ttttcaacct tatttccaga tacglaactc				897
atcgtccgtt gtaacttttt tactggcttt				927

&lt;210&gt; 32

&lt;211&gt; 238

&lt;212&gt; PRT

&lt;213&gt; Escherichia coli

&lt;400&gt; 32

Met Gln Thr Pro His Ile Leu Ile Val Glu Asp Glu Leu Val Thr Arg			
1	5	10	15
Asn Thr Leu Lys Ser Ile Phe Glu Ala Glu Gly Tyr Asp Val Phe Glu			
	20	25	30
Ala Thr Asp Gly Ala Glu Met His Gln Ile Leu Ser Glu Tyr Asp Ile			
	35	40	45
Asn Leu Val Ile Met Asp Ile Asn Leu Pro Gly Lys Asn Gly Leu Leu			
	50	55	60
Leu Ala Arg Glu Leu Arg Glu Gln Ala Asn Val Ala Leu Met Phe Leu			
	65	70	75
Thr Gly Arg Asp Asn Glu Val Asp Lys Ile Leu Gly Leu Glu Ile Gly			
	85	90	95
Ala Asp Asp Tyr Ile Thr Lys Pro Phe Asn Pro Arg Glu Leu Thr Ile			
	100	105	110
Arg Ala Arg Asn Leu Leu Ser Arg Thr Met Asn Leu Gly Thr Val Ser			
	115	120	125

Glu	Glu	Arg	Arg	Ser	Val	Glu	Ser	Tyr	Lys	Phe	Asn	Gly	Trp	Glu	Leu
130						135				140					
Asp	Ile	Asn	Ser	Arg	Ser	Leu	Ile	Gly	Pro	Asp	Gly	Glu	Gln	Tyr	Lys
145					150				155					160	
Leu	Pro	Arg	Ser	Glu	Phe	Arg	Ala	Met	Leu	His	Phe	Cys	Glu	Asn	Pro
				165				170					175		
Gly	Lys	Ile	Gln	Ser	Arg	Ala	Glu	Leu	Leu	Lys	Lys	Met	Thr	Gly	Arg
			180				185					190			
Glu	Leu	Lys	Pro	His	Asp	Arg	Thr	Val	Asp	Val	Thr	Ile	Arg	Arg	Ile
	195					200					205				
Arg	Lys	His	Phe	Glu	Ser	Thr	Pro	Asp	Thr	Pro	Glu	Ile	Ile	Ala	Thr
	210					215				220					
Ile	His	Gly	Glu	Gly	Tyr	Arg	Phe	Cys	Gly	Asp	Leu	Glu	Asp		
225					230				235						